

HOW TO... Calculate mortgage payments in Excel

Want to know how much interest is outstanding on a mortgage, or how overpayments affect the loan term? David Ludlow explains how Excel calculates this automatically

Mortgages are the single biggest loans that most people will ever have, so keeping track of how much is owed is vitally important. It's not always that easy – particularly if you want to calculate the cost of overpayments, which reduce the outstanding balance and therefore reduce the total amount of interest remaining.

Excel can give you a straightforward overview of how much money you owe. In this walkthrough, we will show you how to calculate your own mortgage by creating a loan amortization table, which is the technique used to calculate mortgages. This technique could equally apply to a regular loan.

1 Set up a basic spreadsheet to determine the size of the loan, the number of payments you intend to make, the first payment date and the current interest rate. Make Column A a list of headers and Column B the figures. Set A1 as 'Loan amount' and enter the current mortgage loan into cell B1. Right-click the cell, select Format cells and choose Currency from the list. Then click OK.

Set A2 as 'Number of payments' and type the number of payments you'll make into cell B2. This is the number of monthly payments, so type in the number of years multiplied by 12. Set A3 as 'First payment' and B3 as the date,

using forward slashes (/) to separate the months and days. Finally, set A4 as 'Interest rate'. Right-click B4 and select Format Cells. Select Percentage from the list and click OK. Type your current mortgage rate into this field, remembering to enter the current yearly percentage, now not the APR.

2 We then need to calculate the monthly interest rate. This is used for further calculations, so we don't need it in the same column as our other entries. Use columns C and D, which can be hidden later. For the time being, enter C4 as 'Monthly interest rate' and D4 as '=B4/12'. Format D4 as Percentage, using the right-click menu as above. This formula simply divides the annual percentage rate by 12, giving our monthly figure.

3 Next, we can use all the information that we have typed in to calculate our monthly mortgage payments. Here we are assuming that *L* is the amount of the loan, *I* is the monthly interest rate and *M* is the number of months over which the loan runs. To calculate the monthly payment, we use these variables in the following formula:

$$\text{Monthly payment} = L \times \frac{P}{1 - (1+I)^{-M}}$$

In the spreadsheet, type 'Monthly payment' into cell A5, and '=B1*(D4/(1-(1+D4)^-B2))' into B5. Change the cell's type to currency if necessary.

4 Now that we've calculated the current monthly payment, adjusting the number of payments (in other words, the loan term) or the percentage rate will show us the effects of moving to a different mortgage deal or a change in interest rates. For example, if we change the interest rate from 5.42 per cent to 4.92 per cent (a half-per cent rate cut), we can see that our monthly payments fall from £1,121.15 to £1,067.09. This is useful for simple calculations, but to see the full effect of overpayments we need a bit more detail.

5 We need to create the loan amortization table, which shows us the state of our mortgage after each payment, including the interest paid, the capital outstanding and how much overpayment we've made.

To do this, start by creating the headers. Moving horizontally from cell E1, type the following headers: 'Last payment?' (which we'll use to flag the final payment month), 'Payment date' (to display the date a payment is due), 'Payment amount' (to display our monthly payment including overpayments), 'Interest' (which shows the monthly interest), 'Principal' (which shows the monthly principal payment), and 'Balance' (which shows the outstanding balance).

1 Set up a basic spreadsheet to determine the size of the loan, the number of payments you intend to make, the first payment date and the current interest rate. Make Column A a list of headers and Column B the figures. Set A1 as 'Loan amount' and enter the current mortgage loan into cell B1. Right-click the cell, select Format cells and choose Currency from the list. Then click OK.

	A	B	C	D
1	Loan amount	£184,000.00		
2	Number of payments	300		
3	First payment	01/04/2008		
4	Interest rate	5.42%		

2 We then need to calculate the monthly interest rate. This is used for further calculations, so we don't need it in the same column as our other entries. Use columns C and D, which can be hidden later. For the time being, enter C4 as 'Monthly interest rate' and D4 as '=B4/12'. Format D4 as Percentage, using the right-click menu as above. This formula simply divides the annual percentage rate by 12, giving our monthly figure.

	A	B	C	D
1	Loan amount	£184,000.00		
2	Number of payments	300		
3	First payment	01/04/2008		
4	Interest rate	5.42% Monthly interest rate		0.45%

3 Next, we can use all the information that we have typed in to calculate our monthly mortgage payments. Here we are assuming that *L* is the amount of the loan, *I* is the monthly interest rate and *M* is the number of months over which the loan runs. To calculate the monthly payment, we use these variables in the following formula:

	A	B	C	D
1	Loan amount	£184,000.00		
2	Number of payments	300		
3	First payment	01/04/2008		
4	Interest rate	5.42% Monthly interest rate		0.45%
5	Monthly payment	=B1*(D4/(1-(1+D4)^-B2))		

4 Now that we've calculated the current monthly payment, adjusting the number of payments (in other words, the loan term) or the percentage rate will show us the effects of moving to a different mortgage deal or a change in interest rates. For example, if we change the interest rate from 5.42 per cent to 4.92 per cent (a half-per cent rate cut), we can see that our monthly payments fall from £1,121.15 to £1,067.09. This is useful for simple calculations, but to see the full effect of overpayments we need a bit more detail.

	A	B	C	D
1	Loan amount	£184,000.00		
2	Number of payments	300		
3	First payment	01/04/2008		
4	Interest rate	4.92% Monthly interest rate		0.41%
5	Monthly payment	£1,067.09		

5 We need to create the loan amortization table, which shows us the state of our mortgage after each payment, including the interest paid, the capital outstanding and how much overpayment we've made.

	D	E	F	G	H	I
1		Last payment?	Payment date	Payment amount	Interest	Principal
2						

6 To do this, start by creating the headers. Moving horizontally from cell E1, type the following headers: 'Last payment?' (which we'll use to flag the final payment month), 'Payment date' (to display the date a payment is due), 'Payment amount' (to display our monthly payment including overpayments), 'Interest' (which shows the monthly interest), 'Principal' (which shows the monthly principal payment), and 'Balance' (which shows the outstanding balance).

	A	B	C	D	E	F	G	H	I
1	Loan amount	£184,000.00							
2	Number of payments	300							
3	First payment	01/04/2008							
4	Interest rate	4.92% Monthly interest rate							
5	Monthly payment	£1,067.09							

payment' (which will display how much the loan will be reduced by after interest), 'Loan balance' (to display the current balance) and 'Overpayment' (which lets us specify a one-off extra payment).

6 Now we need to complete each row of our table. Starting with the first row, use the Last payment? column to set a flag if the loan balance has been reduced to zero. We can do this easily with an IF statement. Set cell E2 to '=IF(AND(J2<0.001, G2>0), "Y", "")'. The reason for checking if the balance is less than 0.001 is that Excel may end up with a very small fraction in the final row, which we'll count as the loan being paid off. We're also checking that the Payment amount is greater than zero, as this ensures that we get only one Y in the Last payment? column.

If the Loan amount is positive, the field will be left blank. Click cell E3, click and hold the small square and drag downwards to populate this formula across the same number of cells as there are payments. This is 300 in our example, but you can go further if you want to account for longer mortgage periods. Excel might start putting Ys in all the cells due to a quirk in the way it works.

Next we need to set the Payment date, remembering to set the cell as blank if the loan has been paid off. To do this, set cell F2 to '=IF(B1<0.001, "", B3)'. The Payment amount, cell G2, is our monthly payment, but we want it set to zero if the loan has been paid off. Using a blank causes an error, so set cell G2 to '=IF(B1<0.001, 0, B5)'.

7 The Interest column shows how much interest is owed in a given month, and is calculated by multiplying the monthly interest rate by the outstanding balance as of the previous month. For the first row, then, this is the full loan amount. Remember that we want to set the cell to zero if the loan has been paid off, so set cell H2 to '=IF(B1<0.001, 0, (D4*B1))'. Format this cell to display as currency.

The Principal payment column displays how much money the mortgage will actually be

reduced by after interest, and includes any overpayments. Its formula is the monthly payment plus the overpayment, minus the interest. Set cell I2 to '=IF(B1<0.001, 0, (G2+K2-H2))' and format as currency.

The Loan balance for the first month is the full loan amount minus the Principal payment, so set cell J2 to '=B1-I2'. Finally, the Overpayment column is where you type in any overpayments. Select all the cells for the length of your mortgage (300 in our example, but you might want to go further to encompass longer mortgages) and format them as currency.

8 The second row is a little different to the first, and we now need to compare everything to the previous month's Loan balance, not the full Loan amount. Set cell E3 to '=IF(AND(J2<0.001, G3>0), "Y", "")'. Select the cell, left-click and hold on the square at the bottom-right and drag downwards to populate this formula throughout the same number of cells as you have payments (down to row 301, in our example). As before, use more cells if you want to see the effects of longer mortgages.

We need to augment the Payment date by one month. To do this, use the EDATE function to add one month to the previous payment date. We want the cell to be blank if the loan has been paid off, so set cell F3 to '=IF(J3<0.001, "", EDATE(F2,1))'. Drag this cell downwards as with the Last payment? column.

The Interest field is different this time, as interest is calculated on the outstanding balance from the previous month. Set cell H3 to be '=IF(J2<0.001, 0, (J2*D\$4))'. The 'D\$4' locks the reference to the monthly interest rate. Drag this cell downwards as before. The Principal payment field is similar. Set cell I3 to '=IF(J2<0.001, 0, G3+K3-H3)'. For the Loan balance, set cell J3 to '=J2-I3'. Select this cell and drag it downwards.

9 You now have a complete amortization table, which shows how monthly interest and loan balance decrease over time. The table will automatically handle a new loan amount, a change in the number of payments or extra overpayments. This will also change the cell in

which the Last payment? flag appears. At this stage, we can add some extra features to our spreadsheet to make it easier to see what's going on at a glance.

In cell A6, enter 'Total interest'. In cell B6, enter '=SUM(H2:H301)', replacing 301 with the cell where your calculation ends. This will calculate the total amount of interest paid. We can now work out the total cost of the loan. Set A7 to 'Total cost of loan' and then set B7 to '=B6+B1'.

10 Now we need to use our Last payment? flag to display the date for the last mortgage payment. Do this using VLOOKUP to search the amortization table. Set A8 to 'Final payment date' and B7 to '= (VLOOKUP("Y", E1:K301, 2, FALSE))'. You may need to change K301 to be the maximum row value of your table, such as K361. The VLOOKUP statement scans the table for the letter Y in the first column and returns the second entry from the matching row, which is the Payment date. Set this cell's format as Date.

11 It's time to tidy the spreadsheet up a bit. We don't need columns C or D, as these are just used for calculations and don't need to be edited. Select C and D, right-click them and select Hide from the menu. The spreadsheet will still work properly, and you can see the effects on the total amount of interest and final payment date when adding overpayments. Adjusting the interest rate will keep the same final payment date, but adjust the total amount of interest paid and your monthly payments will change.

12 You can add extra features to your spreadsheet as you see fit. If you want to make regular overpayments, you could add a cell for this and include this figure in your Principal payment column. You might also want to see how interest accumulates over time. This is easy to do. In cell L1, type 'Cumulative interest'. Set cell L2 to '=IF(B1<0.001, 0, H2)' and cell L3 to '=IF(J2<0.001, 0, SUM(H\$2:H3))'. Select this cell and drag it downwards to see how interest increases each month. **CS**

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Payment date	Payment amount	Interest	Principal payment	Loan balance
01/04/2008	£1,121.15	£831.07	£290.08	=B1-I2

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Payment date	Payment amount	Interest	Principal payment	Loan balance	Overpayment
01/04/2008	£1,121.15	£831.07	£290.08	£184,000.00	
01/05/2008	£1,121.15	£828.12	£293.03	£183,606.88	
01/06/2008	£1,121.15	£825.16	£295.99	£183,211.72	
01/07/2008	£1,121.15	£822.19	£298.96	£182,812.76	
01/08/2008	£1,121.15	£819.21	£301.94	£182,410.82	
01/09/2008	£1,121.15	£816.22	£304.93	£182,005.89	
01/10/2008	£1,121.15	£813.22	£307.93	£181,597.96	
01/11/2008	£1,121.15	£810.21	£310.94	£181,187.02	
01/12/2008	£1,121.15	£807.19	£313.96	£180,773.06	
01/01/2009	£1,121.15	£804.16	£316.99	£180,356.07	
01/02/2009	£1,121.15	£801.12	£319.99	£179,936.08	
01/03/2009	£1,121.15	£798.07	£322.99	£179,513.09	
01/04/2009	£1,121.15	£795.01	£325.99	£179,087.10	
01/05/2009	£1,121.15	£791.94	£328.99	£178,658.11	
01/06/2009	£1,121.15	£788.86	£331.99	£178,226.12	
01/07/2009	£1,121.15	£785.77	£334.99	£177,791.13	
01/08/2009	£1,121.15	£782.67	£337.99	£177,353.14	
01/09/2009	£1,121.15	£779.56	£340.99	£176,912.15	
01/10/2009	£1,121.15	£776.44	£343.99	£176,468.16	
01/11/2009	£1,121.15	£773.31	£346.99	£176,021.17	
01/12/2009	£1,121.15	£770.17	£349.99	£175,571.18	
01/01/2010	£1,121.15	£767.02	£352.99	£175,118.19	
01/02/2010	£1,121.15	£763.86	£355.99	£174,662.20	
01/03/2010	£1,121.15	£760.69	£358.99	£174,203.21	

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3	First payment	01/04/2008		
4	Interest rate	5.42% Monthly Interest Rate		0.45%
5	Monthly payment	£1,121.15		
6	Total interest	£152,344.16		
7	Total cost of loan	=B6+B1		
8				
9				
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	A	B	C	D	E	F
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	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V	W	X	Y	Z
1	Loan amount	£184,000.00																								
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